

NAME \_\_\_\_\_ INDEX NUMBER \_\_\_\_\_

SCHOOL \_\_\_\_\_ DATE \_\_\_\_\_

## LATITUDES AND LONGITUDES

KCSE 1989 – 2012 Form 4 Mathematics Answer all the questions	Working space
<p>1. <b>1989 Q18 P1</b> A globe representing the earth has a radius 0.5m. Points <math>A(10^{\circ}W)</math>, <math>B(0^{\circ}, 35^{\circ}E)</math>, <math>P(60^{\circ}N, 110^{\circ}E)</math> and <math>Q(60^{\circ}N, 120^{\circ}W)</math> are marked on the globe.</p> <p>(a) Find the length of the arc AB, leaving your answer in terms of <math>\pi</math> (3 marks)</p> <p>(b) If O is the centre of the latitude <math>60^{\circ}N</math>, find the area of the minor sector OPQ (5 marks)</p>	
<p>2. <b>1990 Q18 P1</b> (a) Calculate the distance round the latitude <math>60^{\circ}N</math>. (Take the radius of the earth, <math>R = 6370</math> km and <math>\pi = \frac{22}{7}</math>) (4 marks)</p> <p>(b) An aeroplane flew due south from a point A (<math>60^{\circ}N, 45^{\circ}E</math>), to a point B. The distance covered by the aeroplane was 800km. Determine the position of B. (4 marks)</p>	
<p>3. <b>1991 Q13 P2</b> The latitude and longitude of two stations A and B are (<math>47^{\circ}N, 25^{\circ}E</math>) and (<math>47^{\circ}N, 70^{\circ}E</math>). Calculate the distance in</p>	

	<p>nautical miles between A and B along latitude <math>47^{\circ}</math> N. (3 marks)</p>	Working Space
4.	<p><b>1992 Q11 P2</b> A point Q is 2000 nm to the west of P (<math>60^{\circ}</math>N, <math>0^{\circ}</math>). Find the longitude of Q to the nearest degree. (3 marks)</p>	
5.	<p><b>1994 Q18 P1</b> A and B are two points on the latitude <math>40^{\circ}</math> N. The two points lie on the longitudes <math>20^{\circ}</math> W and <math>100^{\circ}</math>E respectively. Calculate</p> <p>(i) The distance from A to B along a parallel of latitude (5 marks)</p> <p>(ii) The shortest distance from A to B along a great circle (Take <math>\pi = \frac{22}{7}</math> and <math>R = 6370</math> km) (4 marks)</p>	
6.	<p><b>1995 Q24 P1</b> An aeroplane flies from a point A (<math>1^{\circ} 15'S</math>, <math>37^{\circ}</math>E) to a point B directly north of A. The arc AB subtends an angle of <math>45^{\circ}</math> at the centre of the earth. From B, the aeroplane flies due West to a point C on longitude <math>23^{\circ}</math> W. (Take the value of <math>\pi</math> as <math>\frac{22}{7}</math> and radius of the earth as 6370)</p> <p>a) (i) Find the latitude of B (ii) Find the distance travelled by the aeroplane between B and C</p>	

	<p style="text-align: right;">(5marks)</p> <p>b) The aeroplane left B at 1.00 am local time. When the aeroplane was leaving B, what was the local time at C?</p> <p style="text-align: right;">(2marks)</p>	
		Working space
7.	<p><b>1996 Q20 P1</b></p> <p>The position of two A and B on the earth's surface are (<math>36^{\circ}</math> N, <math>49^{\circ}</math>E) and (<math>360^{\circ}</math>N, <math>131^{\circ}</math> W) respectively.</p> <p>(a) Find the difference in longitude between town A and town B (2 marks)</p> <p>(b) Given that the radius of the earth is 6370, calculate the distance between town A and town B.</p> <p>(c) Another town, C is 840 east of town B and on the same latitude as towns A and B. Find the longitude of town C.</p>	
8.	<p><b>1997 Q18 P1</b></p> <p>A ship leaves an island (<math>5^{\circ}</math>N, <math>45^{\circ}</math>E) and sails due east for 120 hours to another island. The average speed of the ship is 27 knots.</p> <p>(a) Calculate the distance between the two islands</p> <p style="padding-left: 40px;">(i) in nautical miles</p> <p style="padding-left: 40px;">(ii) in kilometers</p> <p>(b) Calculate the speed of the ship in kilometers per hour</p> <p>(c) Find the position of the second island (take 1 nautical mile to be 1.853 Km and the radius of the earth to be 6370 Km)</p>	
9.	<p><b>1998 Q20 P1</b></p> <p>The position of two towns X and Y are given to the nearest degree as X (<math>45^{\circ}</math> N, <math>10^{\circ}</math>W) and Y (<math>45^{\circ}</math> N, <math>70^{\circ}</math>W)</p> <p>Find</p>	

	<p>a) The distance between the two towns in</p> <p>(i) Kilometers ( take the radius of the earth as 6371)</p> <p>(ii) Nautical miles ( take 1 nautical mile to be 1.85 km)</p> <p>(b) The local time at X when the local time at Y is 2.00 pm.</p>	
10.	<p><b>2000 Q22 P1</b></p> <p>A plane leaves an airport A (38.5°N, 37.05°W) and flies due North to a point B on latitude 52°N.</p> <p>(a) Find the distance covered by the plane</p> <p>(b) The plane then flies due east to a point C, 2400km from B. Determine the position of C</p> <p>Take the value <math>\pi</math> of as <math>\frac{22}{7}</math> and radius of the earth as 6370 km</p>	Working space
11.	<p><b>2001 Q24 P1</b></p> <p>A plane flying at 200 knots left an airport A (30°S, 31°E) and flew due North to an airport B ( 30° N, 31°E)</p> <p>(a) Calculate the distance covered by the plane, in nautical miles</p> <p>(b) After a 15 minutes stop over at B, the plane flew west to an airport C ( 30°N, 13°E) at the same speed.</p> <p>Calculate the total time to complete the journey from airport C, through airport B.</p>	

		Working space
12.	<p><b>2003 Q24 P1</b>  Two towns A and B lie on the same latitude in the northern hemisphere.  When its 8am at A, the time at B is 11.00am.</p> <p>a) Given that the longitude of A is 150 E find the longitude of B. (2 marks)</p> <p>b) A plane leaves A for B and takes <math>3\frac{1}{2}</math> hours to arrive at B travelling along a parallel of latitude at 850km/h.  Find:</p> <p>(i) The radius of the circle of latitude on which towns A and B lie. (3 marks)</p> <p>(ii) The latitude of the two towns (take radius of the earth to be 6371km) (3 marks)</p>	
13.	<p><b>2006 Q16 P2</b>  Two places P and Q are at ( <math>36^{\circ}\text{N}</math>, <math>125^{\circ}\text{W}</math>) and <math>36^{\circ}\text{N}</math>, <math>125^{\circ}\text{W}</math>) and <math>36^{\circ}\text{N}</math>, <math>125^{\circ}\text{W}</math>) and <math>36^{\circ}\text{N}</math>, <math>55^{\circ}\text{E}</math>) respectively.  Calculate the distance in nautical miles between P and Q measured along the great circle through the North pole.  ( 3 marks)</p>	

		Working space
14.	<p><b>2007 Q13 P2</b></p> <p>Two places A and B are on the same circle of latitude north of the equator. The longitude of A is <math>118^{\circ}\text{W}</math> and the longitude of B is <math>133^{\circ}\text{E}</math>. The shorter distance between A and B measured along the circle of latitude is 5422 nautical miles.</p> <p>Find, to the nearest degree, the latitude on which A and B lie ( 3 marks)</p>	
15.	<p><b>2008 Q7 P2</b></p> <p>An aero plane flies at an average speed of 500 knots due East from a point P(<math>53.4^{\circ}\text{E}, 40^{\circ}\text{E}</math>) to another point Q. It takes <math>2\frac{1}{4}</math> hours to reach point Q.</p> <p>Calculate:</p> <p>(i) The distance in nautical miles it travelled; (1 mark)</p> <p>(ii) The longitude of point Q to 2 decimal places (2 marks)</p>	
16.	<p><b>2009 Q13 P2</b></p> <p>Point (<math>40^{\circ}\text{S}, 45^{\circ}\text{E}</math>) and point Q (<math>40^{\circ}\text{S}, 60^{\circ}\text{W}</math>) are on the surface of the Earth.</p> <p>Calculate the shortest distance along circle of latitude between the two points (3 marks)</p>	

		Working space
17.	<p><b>2010 Q19 P2</b></p> <p>The position of three points A, B and C are (<math>34^{\circ}\text{N}</math>, <math>16^{\circ}\text{W}</math>), (<math>34^{\circ}\text{N}</math>, <math>24^{\circ}\text{E}</math>) and (<math>26^{\circ}\text{S}</math>, <math>16^{\circ}\text{W}</math>) respectively.</p> <p>a) Find the distance in nautical miles between:</p> <p>i) Port A and B to the nearest nautical miles; (3 marks)</p> <p>ii) Ports A and C. (2 marks)</p> <p>b) A ship left port A on Monday at 1330h and sailed to Port B at 40 knots.</p> <p>Calculate:</p> <p>i) The local time at port B when the ship left port A; (2 marks)</p> <p>ii) The day and the time the ship arrived at port B (3 marks)</p>	
18.	<p><b>2011 Q14 P2</b></p> <p>A point M (<math>60^{\circ}\text{N}</math>, <math>18^{\circ}\text{E}</math>) is on the surface of the earth. Another point N is situated at a distance of 630 nautical miles east of M.</p> <p>Find;</p> <p>a) the longitude difference between M and N; (2 mark)</p> <p>b) the position of N (1 mark)</p>	

Working space

19.

**2012 Q22 P2**

A tourist took 1h 20 minutes to travel by an aircraft from T(3°S, 35°E) to town U(9°N,35°E). (Take the radius of the earth to be 6370km and  $\pi = \frac{22}{7}$  ,

- a) Find the average speed of the aircraft. (3 marks)
- b) After staying at town U for 30 minutes, the tourist took a second aircraft to town V (9°N,5°E). The average speed of the second aircraft was 90% that of the first aircraft. Determine the time, to the nearest minute, the aircraft took to travel from U to V. (3 marks)
- c) When the journey started at town T, the local time was 0700h. Find the local time at V when the tourist arrived. (4 marks)



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